In a nutshell

Manufacturing is the process of adding value to raw materials by turning them into products. Recently, some industries within UK manufacturing have been characterised by declining employment and productivity. A major challenge has also come from emerging economies, such as China and India, which are able to produce goods more cheaply. The global economic slow-down and rising energy and materials costs have also affected manufacturers.

However, UK manufacturing is in a strong position to respond to new challenges and future opportunities by exploiting its well-established strengths in aerospace, pharmaceuticals, chemicals and electronics, in addition to recognising the need to diversify and to embrace new and evolving markets. To do this successfully, manufacturing industries need to employ well-qualified and multi-skilled graduates.

What kind of work can I do?

Opportunities for graduates are available in:

- **research and development** - scientists, engineers, technologists, market researchers, analysts, see chemical engineer; aeronautical engineer; automotive engineer; mechanical engineer; biomedical engineer;
- **design** - design engineers, see industrial/product designer;
- **production** - plant and production managers, manufacturing engineers, quality assurance professionals, process engineers, see electrical engineer; manufacturing engineer; manufacturing systems engineer; product/process development scientist; production manager; quality manager; industrial buyer;
- **distribution and logistics management** - see logistics and distribution manager.

What’s it like working in this industry?

- Over the past decade, British manufacturing has become increasingly hi-tech, resulting in more standardised working hours and better conditions of service for employees.
- There are many opportunities in engineering, but this profession is still heavily male-dominated. Opportunities in business and sales are more evenly balanced between the sexes.
- Graduate starting salaries range from £15,000 to £25,000, and from £26,250 to £40,000 after training.
- Working environments vary considerably from offices to noisy factories and industrial plants, depending on the role. Modern manufacturing is mainly high tech and, with a few exceptions, very clean.

**SEMTA: The Sector Skills Council for Science, Engineering and Manufacturing Technologies** has a useful Careers & Qualifications section with information on working in this industry.
Manufacturing has been, and continues to be an important part of the UK economy. It accounts for 12.8% of UK gross domestic product (GDP) and 55% of total exports. The manufacturing sector expanded again in the first quarter of 2011, its sixth consecutive quarter of growth. However, the manufacturing workforce has fallen sharply over the past 30 years, from 5.8 million in March 1981 to 2.5 million in March 2011, which is around 8% of the UK workforce (UK Parliament, 2011). No single industry dominates UK manufacturing output, as it encompasses a wide range of industries:

- **aerospace** - manufacture, maintenance, repair and overhaul of aircraft and spacecraft.
- **automotive** - manufacture of bodies (coachwork) and accessories for motor vehicles, engines, components and trailers.
- **biotechnology** - concerned with the application of knowledge about living organisms and their components to industrial products and processes.
- **chemicals** - manufacture of pharmaceuticals, paints, toiletries, varnishes, plastics, synthetic rubber and industrial gases.
- **clothing and footwear** - production of materials such as leather and textiles; product design; manufacture of clothes and footwear.
- **electrical equipment** - manufacture of a wide range of products for everyday use, including office machinery, computer equipment, TV and radio receivers, control apparatus and electricity distribution.
- **electronics** - creation, design, production and sale of electronic systems, components and equipment.
- **food and drink** - manufacture of all beverages and food including bakery, meat and poultry.
- **marine** - production, maintenance and repair of ships, submarines, boats and marine equipment.
- **metals and engineered metal products** - production, processing and distribution of ferrous and non-ferrous metals, including the recycling of the materials at the end of their useful life.
- **pharmaceuticals** - development and production of products for the prevention and treatment of illness and disease.
- **polymers** - four discrete process areas: plastics processing, rubber processing, polymer composite processing, and sign making.
- **process manufacturing** - production of building products, coatings, extractives, glass, printing and paper and furniture.

Employment in the sector varies by region. It is highest in the East Midlands, where it accounts for about one job in eight. By contrast, less than 3% of jobs in London are in manufacturing. The year from March 2010 to March 2011 saw different trends in employment across the regions. The manufacturing workforce in Wales grew by 8% and in the South East by 7%. London and Scotland, however, saw falls of more than 10% over the same period. (UK Parliament, 2011)

Although opportunities are available throughout the UK, some industries tend to be concentrated in one or more regions. For example, aerospace has a heavier presence around the Bristol area, motor vehicle manufacture takes place largely in the Midlands, and oil and gas related industries are concentrated in Aberdeen and the surrounding area.

For information on working overseas, see the Opportunities abroad section.
Entry and progression

How do I find a job?

- Many manufacturing industries are dominated by several large graduate recruiters. They have comprehensive websites and well-designed graduate training schemes. They often visit graduate and internship fairs and host university presentations to source future employees. These organisations usually start their recruitment campaign one year in advance of the starting date, and some have early closing dates.
- The industry is also characterised by hundreds of small or medium-sized enterprises (SMEs) – see the Typical employers section. They rarely offer graduate training schemes and advertise year-round, usually via university careers services, relevant academic departments and the local press. It is always worthwhile applying speculatively to SMEs.
- Specialist press and websites such as New Scientist Jobs; Nature Jobs; The Career Engineer; Packaging Futures and TCE Today advertise jobs. They also publish industry news, which is useful for keeping up to date, and for researching industries and companies in preparation for applications and interviews.
- Job vacancies in manufacturing and processing are also handled by specialist recruitment agencies, including Thomas Telford Recruitment, Griffon, Matchtech, Focus Graduates, Food Industry Careers - UK food jobs, Cranleigh Scientific and Manufacturing Recruitment.
- Careers services also advertise graduate vacancies and internship opportunities.
- Professional bodies relevant to each industry offer careers information and/or advertise jobs. These include the Society of Manufacturing Engineers, the Association of the British Pharmaceutical Industry (ABPI), the Institute of Materials, Minerals and Mining (IOM3), the Institute of Mechanical Engineers (IMechE), the Royal Aeronautical Society and the Food and Drink Federation. Attending industry events organised by a relevant professional body or trade association is a good way to meet and network with potential employers, make contacts and find out about opportunities.
- As manufacturing is a process that occurs across a wide variety of industries, see types of jobs and other industry insights for further information on specific roles, professional bodies, trade associations and recruitment practices.

What skills do I need?

Entry to graduate training schemes with leading global manufacturers is competitive and some will require a high degree classification and number of UCAS points. The application process typically consists of several stages, including online applications and psychometric tests, interviews and assessment centres.

Many other employers, however, such as small to medium-sized companies, are more flexible with regards to entry requirements.

In addition to technical knowledge, employers typically look for skills in the following areas:

- people management - teamwork, influencing, negotiation, leadership;
- communication - writing, presenting, computer literacy;
- organisation - time management, resilience, flexibility;
- thinking - problem solving, numeracy, creativity, judgement.
Employers also look for a genuine interest in and understanding of the industry, so it is important to keep up to date with the latest developments.

Internships, work experience, sports and societies, voluntary work and being an active student member of industry-related societies and professional bodies can help you to develop the skills sought by employers.

**Where can I find work experience?**

For many roles within manufacturing, obtaining relevant work experience is highly valuable and, in some cases, essential.

Increasingly, the biggest companies are offering internship or work-placement programmes to attract future recruits before their final year. Competition for positions within large firms can be high so it is also worth approaching small companies to enquire about work experience. Opportunities with smaller firms are not always advertised, so it is a good idea to research companies you are interested in and apply speculatively.

Be aware that some manufacturing plants shut down over the summer, which may limit opportunities for summer vacation placements.

Organisations such as Step provide opportunities for students and graduates to work with smaller firms on project-based work placement programmes.

**Is postgraduate study useful?**

This depends on the industry you are applying to, the product you will be working on, and how specialised the work is that you want to do.

- For business-related jobs, an undergraduate degree is usually sufficient.
- For some jobs in design and research and development, a Masters or a PhD is useful, and sometimes essential.
- Many of the more specialised science roles require a Masters or PhD.
- Increasingly, engineers applying for places on graduate schemes with large organisations are expected to have at least an undergraduate Masters degree (e.g. an MEng) to facilitate working towards chartership with relevant professional bodies.

Some companies support part-time postgraduate study alongside work, in order to assist your professional development.

For more specific advice on the qualifications required in particular industries and for individual roles, see *types of jobs*.

**How can my career develop?**

Most employers support graduate career development. For engineers, scientists, accountants and other professionals there is a formal career pathway. Each industry’s professional body has specific career development and continuing professional development (CPD) information and advice on its website.

Other career development opportunities include:
• skills and technical development courses;
• mentoring and networking;
• sponsorship for graduates requiring further qualifications at postgraduate/conversion level.

Promotion is dependent on gaining the appropriate practical experience and undergoing the relevant training, and sometimes on gaining professional qualifications and chartered or incorporated status. Speed of promotion can also depend on:

• being professionally and geographically flexible;
• developing contacts and raising external profile through participation in industry conferences and networks;
• active membership of the appropriate professional institutions.

Progression will also depend on your own ambitions. You may choose to progress on a technical, management or commercial path.

Gaining chartered or incorporated status will earn you recognition overseas as well as in the UK.

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**Typical employers**

**Big players**

These generally have well-developed graduate development programmes, providing comprehensive experience and training, and responsibility is often given very early on.

Companies typically recruit large numbers of graduates into sales and marketing, IT, human resources, business and commercial, engineering, research and development (R&D), supply chain, finance and procurement roles. Major companies include:

- **AkzoNobel** - specialty chemicals producer. Recruits graduates annually into a variety of career areas. Also offers internships and summer placements.
- **BAE Systems** - a defence, security and aerospace company. Recruits graduates into business, engineering and finance. Also offers 12-month industrial placements.
- **BP** - Recruits graduates and student interns into engineering, science and business roles.
- **Cadbury** - Recruits graduates into supply chain, engineering, science and technology, sales and marketing, and finance. Also offers industrial placements. Cadbury became part of Kraft Foods in Feb 2010.
- **ExxonMobil** - Recruits graduates into ten graduate schemes. Also offers 12-month and eight week placements starting in July each year, as well as a geoscience scheme for postgraduates.
- **GlaxoSmithKline (GSK)** - research-based pharmaceutical company. Recruits graduates into a variety of graduate development schemes, and also advertises graduate jobs all year round. Offers undergraduate internships and an MBA development scheme.
- **Nestlé** - Recruits graduates into a variety of schemes, including a Manufacturing & Focused Improvement programme. Also offers industrial placements and summer internships.
Procter & Gamble (P&G) - world’s largest FMCG (fast moving consumer goods) company. Recruits graduates from various backgrounds for entry level, managerial and non managerial positions. Also offers short and long term internships.

Schlumberger - world’s leading oilfield services provider. Recruits graduates, as well as offering field-based, office-based and research centre internships.

Siemens - a leading global engineering company. Recruits graduates into engineering, business and IT. Also has undergraduate placement opportunities.

Thales Group - a major global technology company for the aerospace, defence, and security and transport markets. Recruits graduates into a range of engineering and business functions.

Small to medium-sized enterprises (SMEs)

SMEs are organisations with less than 250 employees and an annual turnover of no more than £44million. Working for a smaller company can be rewarding because you are more likely to forge a path for yourself within the company.

SMEs are unlikely to use the testing and assessment techniques of larger companies, or follow lengthy recruitment procedures. SMEs are more likely to advertise their vacancies through the local press, university careers service bulletins, local graduate vacancy listings, jobcentres, and word of mouth, rather than rely on their reputation and a presence at graduate recruitment fairs.

If you start out in a smaller manufacturing company, your training may be less structured. However, smaller organisations can provide fantastic opportunities to gain experience in a range of manufacturing activities.

Most industries in manufacturing are characterised by hundreds of SMEs. Use the Yellow Pages and Thomson Local to find contact details. Your university careers service should also have listings of jobs with smaller firms. See also the Department for Business, Innovation and Skills (BIS).

Self-employment

Self-employment is possible in this industry but usually only after a sustained period of work experience.

Opportunities abroad

Manufacturing is a truly global industry. To gain a competitive advantage over their rivals, all companies, regardless of size, need to constantly review their source materials and markets. This means that manufacturing offers many opportunities to work or travel abroad.

Companies may require those with specialist qualifications and experience to work in other parts of the world. Engineers in particular are in demand worldwide, and experienced, qualified engineers can choose to travel and work abroad extensively.

Most opportunities for new graduates, however, are short-term or just include some international travel. Long-term jobs or postings abroad are more likely with considerable experience.
A role within an organisation, such as one of the large graduate recruiters listed in the Typical employers section, may give you a better chance of working abroad. They often advertise international opportunities as part of their recruitment campaigns.

The most popular areas of work include:

- accountancy and finance;
- purchasing;
- sales;
- engineering;
- science and technology.

Smaller companies may also have opportunities for graduates in areas such as negotiating new supply chains, investigating new markets for exports, and setting up new plants and offices.

In order to increase your chances of getting a job overseas, thoroughly research the companies that interest you, and ask yourself the following questions:

- Does the company you are interested in operate globally, or is it planning to do so?
- Are the products the company manufactures sold in other countries?
- Does it have a supply chain outside of the UK?
- Is the particular role you are interested in relevant to the company’s global production, for example, marketing, logistics and engineering?
- Do you speak, or are you willing to learn, a foreign language that is relevant to your company’s interests in other countries (if necessary/applicable)?

**Will my qualifications be recognised?**

In general, UK degrees and qualifications are well regarded, but they do not necessarily provide a passport to working abroad. You may be required to undertake further study or training in your chosen country. Check with your professional body to find out about country-specific requirements.

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**Future trends**

**Advanced Manufacturing**

Manufacturing has a key role to play in the UK’s economic recovery. It not only contributes to exports and productivity growth, but also ensures that the UK economy is not overly dependent on sectors such as banking and financial services. In certain regions of the UK, manufacturing is vital to the local economy. Retaining traditional manufacturing skills and recognising the growth potential in the high-tech ‘advanced manufacturing’ sub-sectors are important steps on the road to economic recovery.

The government’s publication ‘The path to strong, sustainable and balanced growth’ (Nov 2010) announced a rolling growth review to consider structural reforms and how to tackle barriers to growth in six different sectors, including manufacturing. It stated that:

"Despite perceptions to the contrary, the UK has real strengths in manufacturing, responsible for over half of all UK exports in 2009. The UK has a strong competitive
advantage in sectors where it is possible to build on the UK’s strong skills and research base, such as aerospace, defence, bio-pharmaceuticals, microelectronics and chemicals, and emerging potential in other sectors including in low carbon vehicle technologies.”

The aims for the sector for the next 10 years are to grow manufacturing in the UK, to make the UK Europe’s leading exporter of high value goods and related services, and to increase the proportion of the workforce seeking, and capable of, a career in manufacturing (UK Parliament, 2011).

**Reverse logistics**
Reverse logistics is concerned with the management of waste or used products. It has become more important recently as governments have introduced legislation to reduce the dumping of waste, so measures have to be taken to re-use, recycle, repair, refurbish and/or re-manufacture what would previously have been dumped. Increasingly, manufacturers must consider the ‘whole life’ of the product, and designers need to plan ahead for how the product will be disposed of at the end of its life.

**Research and development (R&D)**
More than 70% of business R&D in the UK goes into the manufacturing sector, and goods produced in the sector account for nearly half of all UK exports. Research involves exploring new concepts or materials for products as well as making incremental improvements to existing products. The aim of research is to give the manufacturer an edge in the market, by introducing ideas for an improved product or innovating a new, advanced process. The development process involves taking a product design or prototype and making it into a product that can be manufactured. Development teams consider the scale of production (volume), the availability of materials (and their cost), production safety, lead times, quality and overall cost. The government has pledged to provide £200 million a year by 2014-15 to support manufacturing and business development, with a focus on supporting potential high growth companies and the commercialisation of technologies, including funding for an elite network of R&D intensive technology and innovation centres (HM Treasury, Spending Review 2010).

**Shortage of engineers, scientists and technologists**
According to SEMTA: The Sector Skills Council for Science, Engineering and Manufacturing Technologies, around 205,000 jobs will need to be filled within manufacturing sectors between 2010 and 2016 to replace people who retire and meet demand from fast-growing industries like advanced manufacturing.

The perception is that schools are not producing enough pupils who have studied physics, maths and chemistry at A-level or Higher level. The study of these subjects at advanced level is crucial for entry into engineering and science degrees. The government is trying to address this issue, through the National Apprenticeship Service as well as Skills Funding Agency, which offers fully or partially funded training in the sector, but this does not go to the root of the issue.

**Jargon buster**

- **Advanced manufacturing** - the production of technologically complex products using high-level design skills.
- **B2B** - business to business. Refers to trade or business done between businesses, rather than between a business and the general public.
- **B2C** - business to consumer. Refers to trade or business carried out with a customer for their own use, rather than with another business.
• **Capacity requirements planning (CRP)** - the process which determines the amount of labour and/or equipment resource required to meet the planned level of business.

• **Computer aided design (CAD)** - use of a computer to aid in the design and/or production of drawings of parts.

• **Critical resource** - anything which could limit the company's ability to accept an order from a customer.

• **Enterprise resource planning (ERP)** - a computer planning system that uses the manufacturing resource planning (MRPII) principles but in addition should have product configuration facilities, quality assurance management and resource planning for the non-manufacturing areas such as plant maintenance and human resource planning.

• **FMCG** - fast-moving consumer goods, e.g. food and drink.

• **GDP** - gross domestic product: the economy's total income accruing from output; the market value of all goods and services produced within an economic area over a given period of time.

• **Global value chain** - the full range of activities involved in creating, producing and delivering a product, when divided among several companies and spread across the world.

• **Just in time (JIT)** - the progressive reduction of wasteful activities i.e. anything that adds cost but not value to the end product. Examples include any production or delivery in excess of requirements, movement of parts and inspection that is not integrated into the process.

• **Kaizen** - continuous improvement by small changes.

• **Kanban system** - a means to achieve just-in-time (JIT) production. It works on the basis that each process on a production line pulls just the number and type of components the process requires, at just the right time.

• **Lead time** - the uninterrupted time needed to manufacture a part under normal circumstances, or the time required by a vendor to supply an item to their customer.

• **Lean manufacturing** - the reduction to zero of all waste - resources, time and processes in production - in order to maximise productivity.

• **Manufacturing resource planning (MRPII)** - the integrated planning of a company's material, equipment and people to meet the business plan.

• **Milestones** - achievable short term targets at which it is possible to evaluate progress towards a final objective.

• **Supply chain management (SCM)** - the control of the supply of parts from vendor through to customer.

• **Total quality (TQ) or total quality management (TQM)** - the culture of an organisation where continuous improvement is integrated into all activities with the objective of improving the quality of all business processes. Tools include process charts, pareto analysis, cause and effect diagrams, histograms, run diagrams, check sheets and statistical process control.

• **Work centre** - people or equipment (resources) which may be treated as one resource for capacity planning purposes.

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